

# TeralBs DC 6 Development of a THz biosensors test platform based on a skin-on-chip models: Melanoma- and psoriasis-on-chip models

## Short Description

The Tissue Engineering and Regenerative Medicine Group of the Bioengineering Department in collaboration with the Sensors and Instrumentation Techniques Group (SITec) of the Electronic Technology Department, both of the Universidad Carlos III de Madrid, are currently seeking for a PhD student (“Doctoral Candidate”, DC) starting from January 2025 to work **on a THz biosensors test platform based on a skin-on-chip models (Melanoma- and psoriasis-on-chip models)** within the framework of the European Doctoral Training Network “TeralBs” (TeralBs Doctoral Candidate 6).

## Research Programme Description

“**TeralBs - Terahertz Integrated Biosensing from molecular, vesicular to the cellular and tissue level**” is hiring 11 Doctorate Candidates to be funded by the Marie Skłodowska-Curie Actions (MSCA) Doctoral Networks. TeralBs is a highly interdisciplinary and intersectoral Doctoral Network composed of leading academic partners and industrial associated partners. The consortium consists of nine academic institutions, namely: Eindhoven University of Technology (Coordinator), Johann Wolfgang Goethe-Universität (Germany), Universität Siegen (Germany), Universidad Carlos III de Madrid (Spain), Vilnius Universitetas (Lithuania), Università Degli Studi Di Roma La Sapienza (Italy), Università Cattolica del Sacro Cuore (Italy), Centre National de la Recherche Scientifique (France), Friedrich-Alexander-Universität Erlangen Nürnberg (Germany) as well as six associated partners: the Arquimea Research Center (Spain), Fondazione Istituto Italiano di Tecnologia (Italy), Teledyne DALSA (Netherlands), Thermo Fisher Scientific Baltics UAB (Lithuania), Consiglio Nazionale delle Ricerche (Italy), and Sorbonne University (France). The diverse consortium provides a unique and timely opportunity to train students in Terahertz Biosensing.

**The driving force for TeralBs** - is to develop a radically new technology based on Terahertz (THz) radiation for biomedical detection and diagnosis, based on a team of 11 Doctoral Candidates with the necessary in-depth background in devices and systems, spectroscopic techniques, and biomedical measurement knowledge using THz radiation.

**The TeralBs Doctoral Candidates** will be trained by doing research, in which they will demonstrate the potential to analyse and solve complex problems in biomolecular and biomedical sensing using THz technology targeting European industry leadership in this highly challenging sector. For each technical and biomedical challenge, a specifically designed solution to tackle the specific requirements is provided, in order to expose the trainees to a realistic research situation and to foster interdisciplinary collaboration between the Doctoral Candidates. In this way, the Doctoral Candidates will be equipped with an attractive set of transferable skills relevant to innovation, long-term employability, and leadership in the domain of biomedical detection and diagnosis and THz technologies.

All Doctoral Candidates will carry out secondments and placements with academic partners and industrial associated partners at the earliest possible opportunity. Transferable skills and technical workshops from industrial partners will be central to the training of the Doctoral Candidate.

## Host institution

**Universidad Carlos III de Madrid (UC3M)** is a public university founded in 1989. Its mission is to contribute to the improvement of society through teaching of high quality and cutting-edge research and knowledge transfer, in line with stringent international standards. The university is located in the southern metropolitan area of Madrid and consists of five centres, distributed among 4 Campuses. UC3M’s position in the most outstanding rankings and accreditations at the international level, attest to its good performance. According

to a recent study of the Spanish University System U-Ranking 2023, UC3M remains in first place in Spain for its general performance. At an international level, it holds a noteworthy position in the last QS Top 50 Under 50 world ranking at the 35th spot and is among the 10 best young universities in Europe.

**UC3M** has strived, since its foundation, to make research one of the fundamental pillars of its activity, in order to enhance its teaching as well as contributing to the advancement of knowledge and triggering the challenges our society faces. Prioritizing international and interdisciplinary research of excellence, making knowledge open and accessible, and boosting transfer of R+D+i results are key strategies to make this possible. UC3M is organized into 28 Departments and 28 University Research Institutes. In addition, since 2005 it has an Official Catalogue of Research Groups, composed of scholars who share common lines of work, carry out collaborative research projects and publish jointly. The Catalogue is composed of 143 groups, which cover almost all bodies of knowledge and studies at UC3M.

**The Tissue Engineering and Regenerative Medicine group** has focused in recent years on generating increasingly complex in vitro skin models for drug and cosmetic testing, as well as modeling skin diseases with the help of 3D bioprinting technology (3D skin bioprinting) and microfluidic platforms (skin-on-a-chip). On the other hand **the Sensors and Instrumentation Techniques Group** has more than 25 years' experience on the development of sensors and instrumentation systems for biomedical applications, environmental monitoring, gas spectroscopy and non-destructive testing. The group has been involved in more than 25 research projects of public funding (European, National and regional-Comunidad de Madrid). **In a collaboration that last more than eight years**, both groups have been working on the development of non-invasive sensors integrated into different biological models (in-vitro and in-vivo) for the study of skin physiology and the modeling of skin diseases.

### Job Description

- **Project title:** Development of a THz biosensors test platform based on a skin-on-chip models: Melanoma- and Psoriasis-on-chip models.
- **Host institution:** Universidad Carlos III de Madrid
- **PhD enrolment:** Universidad Carlos III de Madrid
- **Supervisors:** Diego Velasco/Leticia Valencia (Universidad Carlos III de Madrid).
- **Research Objectives:** This fundamental project aims at the development of a beyond the state-of-the-art biological platform for the characterization and assessment of THz biosensors. Starting from the melanoma-on-chip model already under development by the UC3M team, the candidate will design a new microfluidic platform that will allow direct access of THz radiation into the culture for measurement purposes. Additionally, the outflow from the skin-on-chip model will be used to assess the use of the THz biosensors developed to detect specific biomarkers in a PoC-like scenario. Subsequently the student will focus on the development of a new model of psoriasis that will be also used to benchmark the THz biosensors developed in the consortium (in this later case only using the outflow from the chip).
- **Expected Results:** Development of a beyond the state-of-the-art biological platform for the characterization and assessment of THz biosensors. Validation of different sensors developed within the project for organ-on-chip applications
- **Secondments:** Secondment periods are planned at Eindhoven University of Technology (Netherlands), Johann Wolfgang Goethe Universität (Germany) and Universität Siegen (Germany).

### Job Requirements

- A master's degree (or an equivalent university degree) in Biomedical Engineering, Biology, Biochemistry or Tissue Engineering.
- Theoretical and applied knowledge or interest in: Cell culture, 3D tissue models, biochemistry techniques (WB, qPCR, electrophoresis...), microscopy, immunohistochemistry, microfluidics, organ-on-chip.
- Expertise with software packages for statistical analysis like R or GraphPad.

- Strong motivation to deliver groundbreaking work and ambition to excel.
- A research-oriented attitude.
- Ability to work in an interdisciplinary team and interested in collaborating with industrial partners.
- Motivated to develop your teaching skills and coach students.
- Fluent in spoken and written English (C1 level).

## Conditions of Employment

- The successful candidates will receive an attractive salary in accordance with the MSCA regulations for Doctoral Candidate DCs. The gross salary includes a living allowance (**approximately € 3100 per month**), a mobility allowance of approximately **€ 600 per month** and, if applicable, a family allowance of approximately **€ 490 per month**. These amounts are nominal (gross) amounts and certain deductions will apply for social security contributions and/or taxes according to the applicable national laws of the country where the recruiting beneficiary is located. The exact (net) salary will be confirmed upon appointment and is dependent on local tax regulations and on the country correction factor (to allow for the difference in cost of living in different EU Member States). The guaranteed PhD funding is for 36 months (i.e. EC funding, additional funding is possible, depending on the local Supervisor, and in accordance with the regular PhD time in the country of origin). In countries where PhDs typically last longer than 36 months, beneficiaries foresee additional funding for the required time to finish the PhD if the DC fulfils all technical requirements at the end of the 36 months.
- **The period of employment in UC3M is 36 months.** In addition to their individual scientific projects, all fellows will benefit from further continuing education, which includes internships and secondments, a variety of training modules as well as transferable skills courses and attractive participation in conferences.
- The Doctoral Candidates are expected to travel to network partners under three secondments for a typical duration of 2-6 months. Additionally, the Doctoral Candidates are expected to participate in outreach activities including, but not limited to, YouTube videos, social media updates, participation in public events and campaigns, as well as dissemination to popular press.

## Eligibility and mobility criteria (mandatory requirements EU rules)

- The recruited researchers must be doctoral candidates, i.e. not already in possession of a doctoral degree at the date of the recruitment.
- The recruited researchers must be employed full-time, unless the granting authority has approved a part-time employment for personal or family reasons
- The recruited researchers must be working exclusively for the project
- Recruited researchers can be of any nationality and must comply with the following mobility rule: they must **not have resided or carried out their main activity** (work, studies, etc.) in the country of the recruiting beneficiary for more than 12 months in the 36 months immediately before the recruitment date - unless as part of a compulsory national service or a procedure for obtaining refugee status under the Geneva Convention

## Application Procedure

### *Documents requested:*

- Complete CV. The candidates are allowed to pursue a maximum of three positions in the TeraIBs programme. If more than one position is pursued, please clearly indicate all the positions that are pursued with priorities on the first page of the CV.
- Motivation letter (maximum 1 page per position applied) should state why the applicant wishes to pursue the specific research and why the applicant thinks to be an ideal candidate for the position.

- Scan of certificates showing BSc, MSc and other courses followed, with grades and if it is possible a ranking.
- Up to three recommendation letters and/or contact e-mail addresses with a brief professional description (title, position, relationship with applicant) of the referring person.
- Up to two written scientific reports in English (e.g. MSc thesis, traineeship report or scientific paper)
- Eligibility Statement: for verifying the MSCA requirements, the candidates clearly indicate the country or countries of the main activity (work, studies, etc) and country or countries of residence in the last 5 years with the exact dates.

#### **Selection Process:**

The selection process of invited candidates contains two phases:

**In the first phase**, a wide range of selection practices will be used (including expert assessment, face-to-face interviews, etc.) to evaluate the potential candidates. The selection committee for each doctoral candidate will be composed of three members: the main supervisor from the hosting institution, a TeralBs representative from another beneficiary and the future secondment manager of the doctoral candidate.

**In the second phase**, the selected candidate will be evaluated by TeralBs' s **Recruitment Board (RB)**. The Board addresses gender balance and diversity issues within the entire Doctoral Network and needs to approve the selected candidate.

The following evaluation criteria will be applied:

- (i) Scientific skills and relevance of their research experience with reference to the specific project;**
- (ii) Capacity/background to undertake the training activities successfully;**
- (iii) expected impact of the proposed training on the researchers' career;**
- (iv) Professional skills and the ability to work in multi-disciplinary and trans-national teams.**

TeralBs deals with a recruitment process based on the European principles of openness, fairness and transparency that guarantee a selection of candidates in respect to merit and gender balance. All institutions have clear equal opportunities policies ensuring equal and fair recruitment and employment of men and women.

Please note that all submitted applications will be checked against the defined eligibility and mobility criteria. Applications that do not follow these criteria will not be considered.

#### **Information:**

Do you recognize yourself in this profile and would you like to know more? Please contact Diego Velasco ([divelasc@ing.uc3m.es](mailto:divelasc@ing.uc3m.es)) and/or Leticia Valencia ([lvalenci@ing.uc3m.es](mailto:lvalenci@ing.uc3m.es)).

**For more information about the individual projects, deadline for application, starting date, how to apply, project duration and any informal enquiries, please have a look at the website of the host institutions.**

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